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## Exploring complementarity of Life Cycle Thinking and Landscape & Urban Planning towards sustainable urban co-design.

Ghada Bouillass, Joris Masafont, Maëlle Baronnet, Nathan Bertho, Philomene Blot, Jeremy Costanzo, Thomas Dubard, Pierre Frodé de La Forêt, Tristan Gaudron, Juliette Gerboux, et al.

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# EXPLORING COMPLEMENTARITY OF LIFE CYCLE THINKING AND LANDSCAPE & URBAN PLANNING TOWARDS SUSTAINABLE URBAN CO-DESIGN



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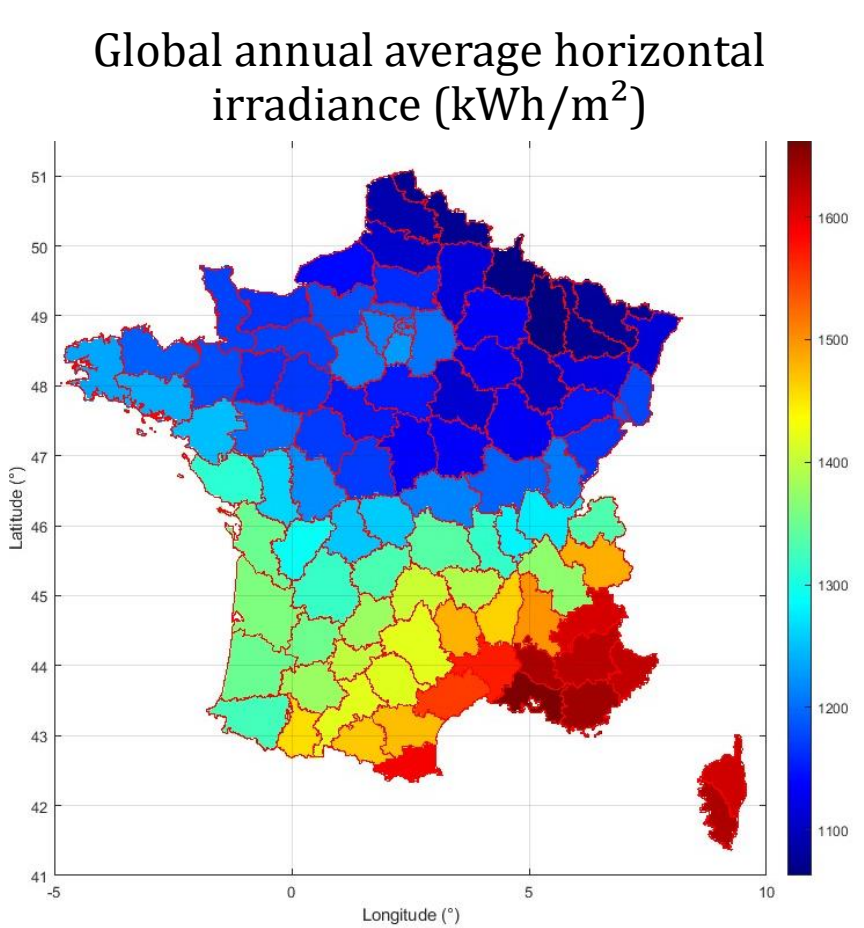
<sup>3</sup>, MINES ParisTech-PSL, 2019 Civil Engineering promotion, France

## INTRODUCTION & OBJECTIVE

- City logistics is **one of the most polluting** segments of the **transport sector**.
- **European regulations** are pushing further urban access restrictions and promoting a shift to more **sustainable solutions**.
- Introducing sustainability into **communities living conditions** and **territorial policies** requires the consideration of:
  - **living environment characteristics**,
  - **stakeholders' needs**,
  - **sustainable technologies** with high environmental, social and economic performance.
- To face this challenges, the **complementarity** of two consistent management approaches have been studied:
  - **Life Cycle Assessment (LCA)**
  - **Landscape and Urban Planning (LUP)**

## REAL CASE STUDY

- Study of the complementarity of both LCA and LUP throughout a real case study in the historical city of **Nice, South of France**.
- **Challenges:**
  - **Complex topography (i.e. narrow streets)**
  - **High density population**
  - **Increasing concentration of transportation flows**
- **Opportunities:**
  - **Remarkable solar deposit encouraging the use of photovoltaics (PV).**
  - **Transport policy shift towards electric mobility**

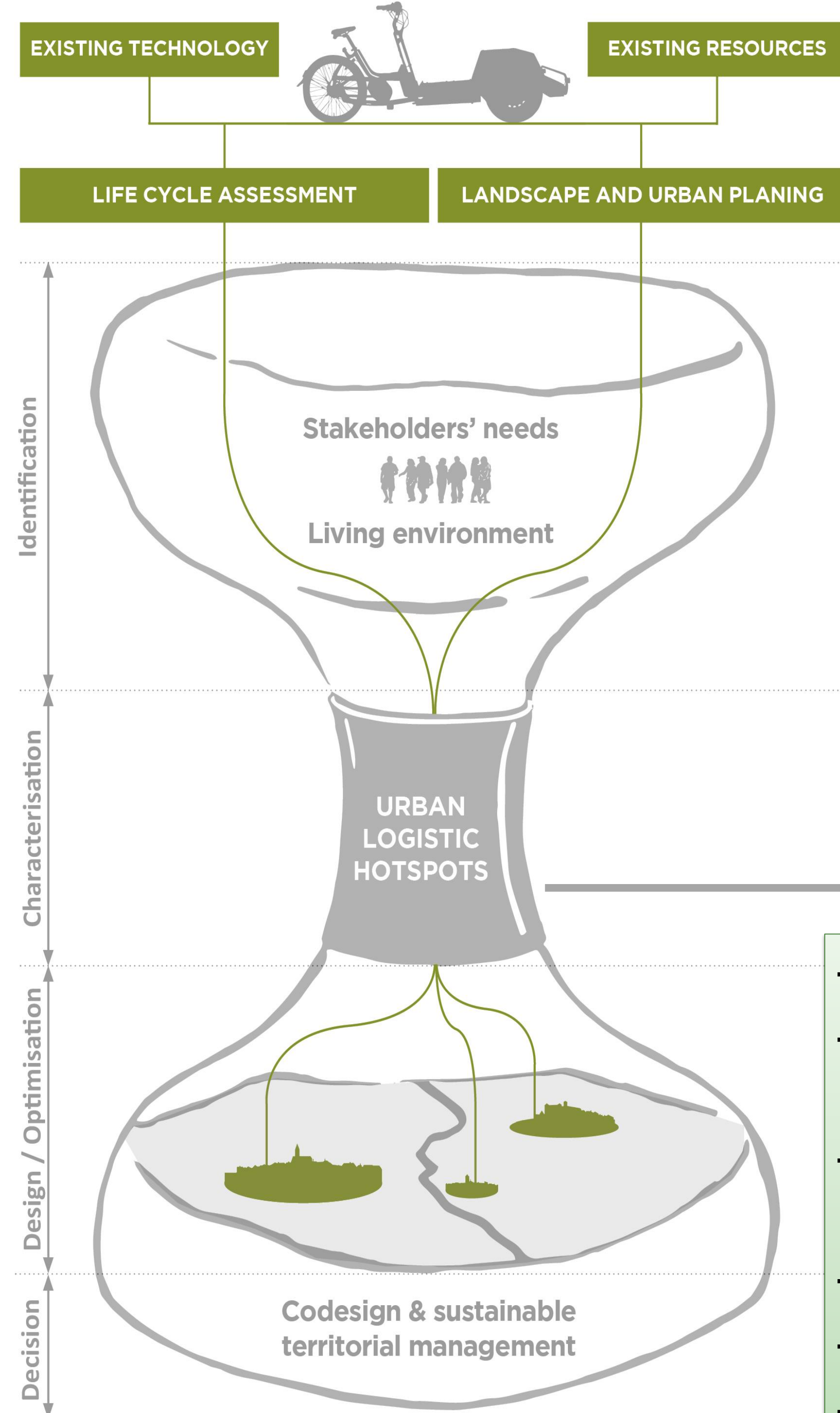


TOWARDS THE CONCEPTUALIZATION OF AN INTEGRATED SUSTAINABLE LOGISTIC SERVICE CO-DESIGN:  
ELECTRIC BASED TRICYCLE TECHNOLOGIES FOR LAST KILOMETER DELIVERY



Tricycle technology for city logistics « Triporteurs de l'Ouest »

## MATERIALS AND METHODS



## STEPS FOR THE SUSTAINABLE CO-DESIGN OF CITY LOGISTIC SERVICES

### Identification step

- LUP application**
  - Territorial reading grid based on:
    - Physical, socio-cultural & economic resources
    - Political context
  - Field visits: urban configuration for logistics
- LCA application**
  - Diesel-power cargo vans vs electricity tricycles: from 285 to 28 gCO<sub>2</sub>eq/km in EU
  - EU mix vs PV: from 400 to 22gCO<sub>2</sub>eq/kWh

### Characterization step

Crossing LCA and LUP through urban metabolism requirements

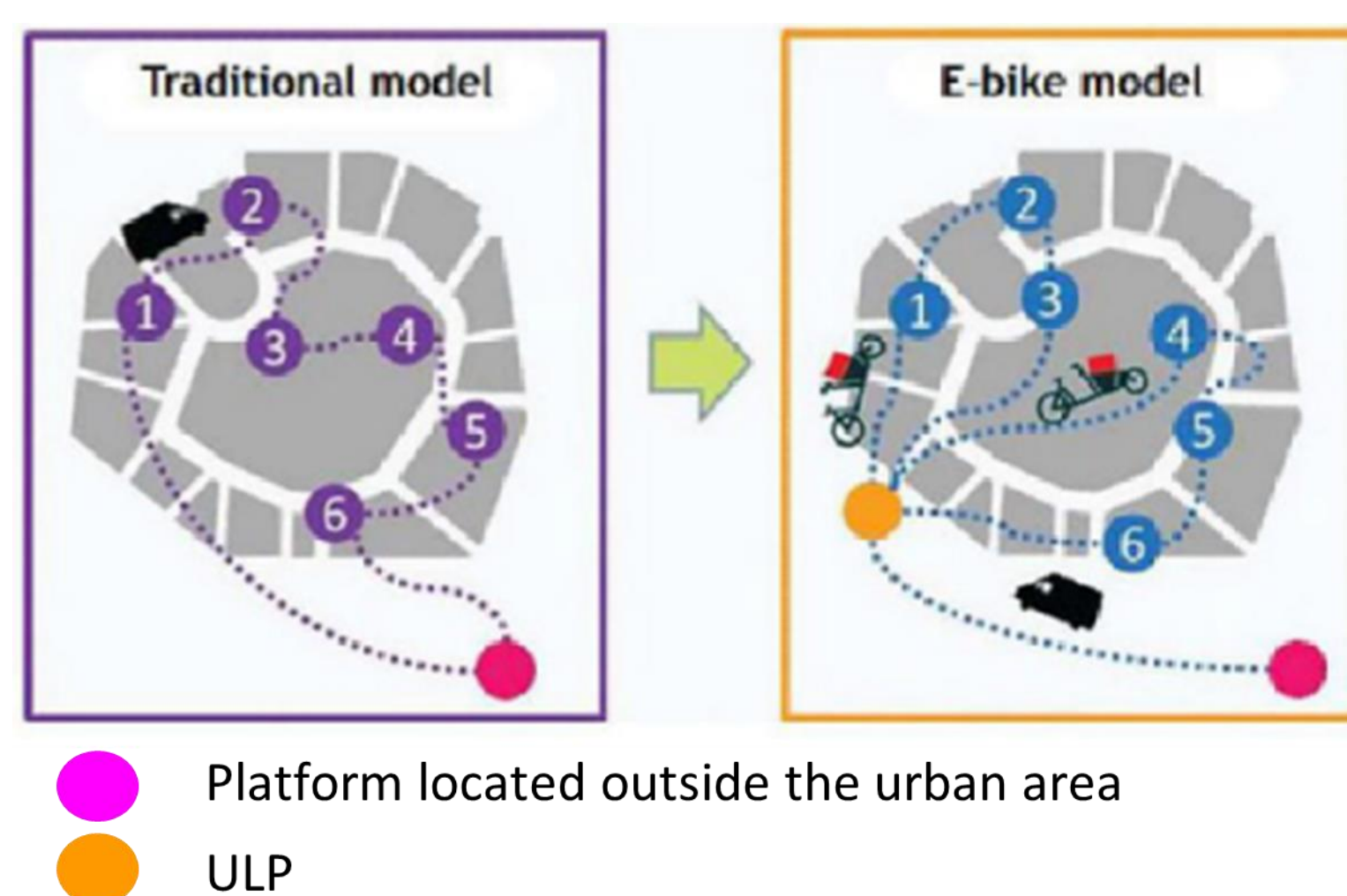
## IDENTIFIED URBAN LOGISTICS HOTSPOTS

- Environmental living conditions such as air pollution, noise and urban congestion
- Stakeholders' needs and concerns (shopkeepers, workers, transport companies, public authorities, etc.) → Social hotspots
- Constraints for scheduling and delivery distribution including technology capacity, time, topography and energy required
- Economic performance of electric tricycles & charging infrastructures
- Potential of renewable energy resources in electric mobility applications
- Real-world local solar data, to be explored through Geographical Information Systems for energy use optimization.

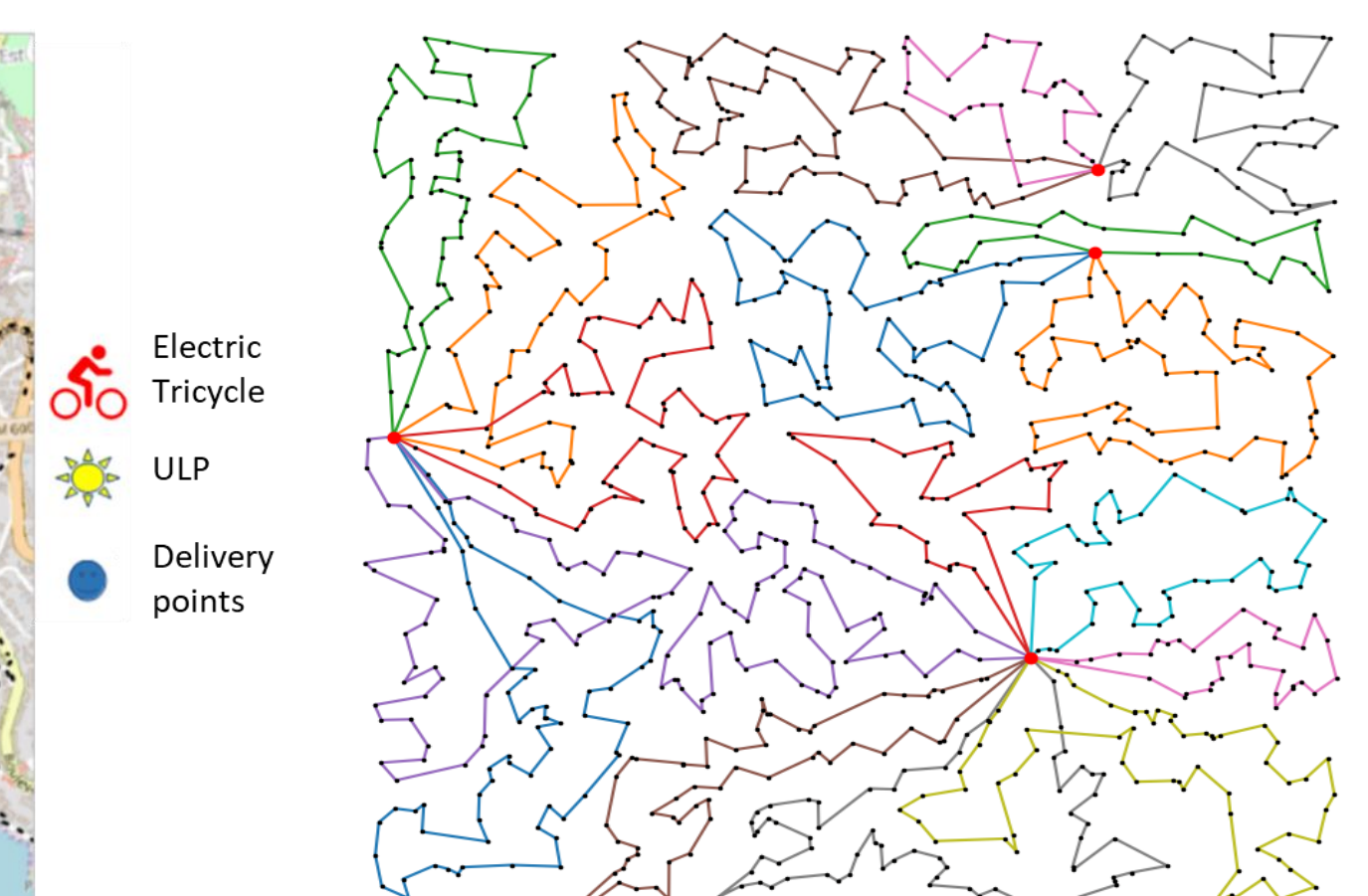
## RESULTS & DISCUSSION

**Design and optimization step : from the electric tricycle technology to Urban Logistic Platforms.**

→ **Optimization of delivery flows through a Clarke and Wright algorithm for 4 ULP and 1000 deliveries' points**



Distribution flows between the ULP and the delivery points in Nice city



Clarke and Wright Algorithm performed for 4 ULP and 1000 delivery points

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## ACKNOWLEDGMENTS



→ **ULP integration in the urban metabolism**



Design of the ULP and its integration in the city metabolism

→ **Dimensioning of ULP and possible other usages of the platform (such as solar energy-based chargers for public electric vehicles) meeting stakeholders' needs and improving their living conditions.**

